

REMARKS

The abstract was amended as the Examiner suggested, although there is no change in scope or meaning. Amendments were made to the description as suggested by the Examiner. The amendments made to claims 1 and 54 are supported at page 16 line 30 to page 17 line 2. Claims 4-7, 20-28, 48, and 53 were amended as suggested by the Examiner to clarify the language. Claims 19 and 35 were amended to further clarify the language. Claim 39 was inadvertently omitted in the application as filed.

1. Status of claims

After amendment, claims 1-38 and 40-54 are pending. Claims 1-54 have been rejected. No new matter has been added. Applicant requests reconsideration of all pending claims.

2. Objection

The Examiner objected to the abstract of the application, because of the use of the term "comprises." Applicant disagrees with the objection, but has amended the abstract to expedite prosecution.

3. Rejections

Rejections under 35 USC §112, second paragraph

Claims 1-54 were rejected by the Examiner under 35 USC §112, second paragraph, as being indefinite. The Examiner objected to claim 1 asserting that "heating at least one of the feed stream, the azeotroping agent..." provides for ambiguity, because the claim initially recites mixing them. Furthermore, the Examiner alleges that the claim is incomplete, because it lacks a

process connection between the mixing and the heating step. The Examiner objected to claims 1, 53 and 54 as not positively reciting a distilling step. One skilled in the art would recognize that distillation involves the production of a vapor and separating that vapor. Applicant has amended the language of claims 1, 53 and 54 to make this clearer. Applicant has amended the language of claims 1 and 54 to make clear the relationship between the mixing step and heating step.

The Examiner objected to claims of the present application as being indefinite, contending that azeotropes are normally defined by their composition and pressure. By definition, an azeotropic mixture is a mixture of two or more liquids, the composition of which does not change upon distillation. One skilled in the art could easily ascertain when the composition of a mixture with respect to certain components is the same as the composition of a vapor stream produced by distillation of the mixture.

The Examiner asserts that the terminology in the claims is improper, citing use of the "the azeotroping agent" in the dependent claims instead of "at least one azeotroping agent" recited in claim 1. The claims have been amended to include the phrase of claim 1.

The Examiner alleges that feedstreams recited in claims 19 and 35 are at odds with the feedstreams recited in the claims from which they depend respectively. While Applicant disagrees with the Examiner's assertion, the claims have been amended to further clarify the language in order to further prosecution.

Provisional rejections for obviousness-type double patenting and double patenting

The Examiner contends that the claims in this application are not patentably distinct from the claims in the copending and commonly owned applications no. 09/809,243 and no. 09/809,649. Applicant does not agree that the claims in this application, as amended, are

patentably indistinct from the claims in the other applications. However, since this is only a provisional rejection, applicant will not comment further at this time.

Rejection of claims 1-16, 18-32, 34, and 36-54 under 35 USC §103(a)

The Examiner rejected claims 1-16, 18-32, 34, and 36-54 as being obvious over Benecke *et al.* (US 5,319,107) with or without Perry *et al.*

The claimed invention (i.e., independent claims 1, 42, 48, 53, and 54) is directed to an azeotropic distillation process comprising an azeotrope that comprises a cyclic ester of a hydroxy organic acid and an azeotroping agent. As conceded by the Examiner, Benecke *et al.* ('107) does not teach an azeotropic distillation involving such an azeotrope. However the Examiner asserts that the codistillation taught by Benecke *et al.* ('107) (col. 13 lines 55-68) would produce an azeotrope comprising the cyclic ester of the hydroxy organic acid and the azeotroping agent, as in the claimed invention. It is known in the art that codistillation and azeotropic distillation are not equivalent.

Codistillation involves a mixture of components that are immiscible. The components act as if they were being heated in different containers with their vapors mixing in the gas phase. Thus, for codistillation $P_{\text{tot}} = P_A^\circ + P_B^\circ$, where P_{tot} is the total pressure of the gas phase above the mixture, P_A° is the equilibrium vapor pressure of component A, and P_B° is the equilibrium vapor pressure of component B. It is known in the art that at a given temperature, a liquid A in an evacuated flask will evaporate until an equilibrium state is reached between the liquid A and its vapor phase; the pressure of the gas phase in this state is the equilibrium vapor pressure of A (P_A°). The temperature at which P_{tot} reaches 1 atm is the normal boiling point of the mixture of components A and B. The boiling point of the mixture is necessarily always lower than the

boiling point of either component. The P_{tot} is independent of the composition of the mixture and depends only on the vapor pressures of the individual components. Thus, the composition of the codistillate is not dependent on the composition of the mixture, as in an azeotropic distillation (discussed below).

In contrast, ordinary distillation of a mixture that approaches an ideal solution can be expressed as $P_{\text{tot}} = P_A + P_B$ (Raoult's law), where $P_A = X_A P_A^\circ$ and $P_B = X_B P_B^\circ$. X_A is the mole fraction of component A in the mixture, and X_B is the mole fraction of component B in the mixture. Thus, P_{tot} depends on the composition of the mixture, as well as the equilibrium vapor pressures of the individual components. Distillation can be used to separate different components of a mixture.

Azeotropes show large deviations from Raoult's law and may have boiling points either higher or lower than the boiling points of the mixture's components. An azeotropic mixture behaves like a single-component fluid, and the component composition of the mixture is the same as the component composition of the azeotropic vapor phase. Further distillation of an azeotrope distillate will result in no further separation and it will boil at a constant temperature. Thus, azeotropic distillation depends on the component composition of the mixture, unlike codistillation.

Perry *et al.* teaches azeotropic distillation at page 13-41. However Perry *et al.* does not teach azeotropes comprising a cyclic ester of a hydroxy organic acid and an azeotroping agent as in the claimed invention, and does not teach codistillation.

Benecke *et al.* ('107) and Perry *et al.* do not teach an azeotropic distillation as in the claimed invention. In light of the discussion above, Applicant respectfully asks that the rejection of claims 1-16, 18-32, 34, and 36-54 be withdrawn.

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Rejection of claim 17 under 35 USC §103(a)

The Examiner further rejected claim 17 as being obvious over Benecke *et al.* ('107) with or without Perry *et al.*, and in further view of Baniel *et al.* (US 5,510,526). Benecke *et al.* ('107), Perry *et al.*, and Baniel *et al.* ('526) do not teach an azeotrope comprising a cyclic ester of a hydroxy organic acid and an azeotroping agent as in the claimed invention. Since the references do not teach every element of the claimed invention, Applicant requests that claim 17 be allowed.

Rejection of claim 33 under 35 USC §103(a)

The Examiner further rejected claim 33 as being obvious over Benecke *et al.* ('107) with or without Perry *et al.*, and in further view of WO 00/64850. Benecke *et al.* ('107), Perry *et al.*, and WO 00/64850 do not teach an azeotrope comprising a cyclic ester of a hydroxy organic acid and an azeotroping agent as in the claimed invention. Since the references do not teach every element of the claimed invention, Applicant requests that claim 33 be allowed.

Rejection of claim 35 under 35 USC §103(a)

The Examiner further rejected claim 35 as being obvious over Benecke *et al.* ('107) with or without Perry *et al.*, and in further view of Kulprathipanja *et al.* (US 5,068,418). Benecke *et al.* ('107), Perry *et al.*, and Kulprathipanja *et al.* ('418) do not teach an azeotrope comprising a cyclic ester of a hydroxy organic acid and an azeotroping agent as in the claimed invention. Since the references do not teach every element of the claimed invention, Applicant requests that claim 35 be allowed.

Applicant respectfully requests that the rejection of these claims be withdrawn.

None of the references alone or combined teach or suggest the claimed invention. Thus, in light of the amendments and the discussion above, Applicant believes claims 1-38 and 40-54 are now in condition for allowance.

Information Disclosure Statements

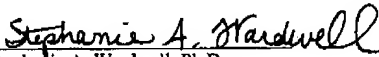
Applicant thanks the Examiner for the initialed copy of the form PTO-1449 that was filed on August 15, 2003, and resubmitted by fax on February 23, 2004. Applicant has not yet received initialed copies of the forms PTO-1449 that were filed on May 9, 2001 and April 30, 2003. Copies of those documents are attached, and applicant requests that they be initialed and returned in the next action.

The Examiner is invited to contact the undersigned patent agent at (713) 934-4077 with any questions, comments or suggestions relating to the referenced patent application.

Respectfully submitted,

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June 9, 2004


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Agent for Applicants

Page 1 of 1

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| Form PTO-1449 (modified) | | Atty. Docket No. 2027.601000/KDG | Serial No. 09/809,534 |
| List of Patents and Publications for Applicant's INFORMATION DISCLOSURE STATEMENT (Use several sheets if necessary) | | Applicants Michael Charles Milner Cockrem/Istvan Kovacs | |
| | | Filing Date: March 15, 2001 | Group: 1764 |
| U.S. Patent Documents See Page 1 | Foreign Patent Documents See Page 1 | Other Art See Page 1 | |

U.S. Patent Documents

| Exam. Init. | Ref. Des. | Document Number | Date | Name | Class | Sub Class | Filing Date of App. |
|-------------|-----------|-----------------|------------|-----------------------|-------|-----------|---------------------|
| | A17 | 6,160,173 | 12/12/2000 | Eyal et al. | 562 | 589 | 10/26/1999 |
| | A18 | 6,153,708 | 11/28/2000 | Aizawa et al. | 525 | 420 | 03/18/1999 |
| | A19 | 5,502,215 | 03/26/1996 | Yamaguchi et al. | 549 | 274 | 12/02/1994 |
| | A20 | 5,068,418 | 11/26/1991 | Kulprathipanja et al. | 562 | 580 | 05/08/1989 |
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Foreign Patent Documents

| Exam. Init. | Ref. Des. | Document Number | Date | Country | Class | Sub Class | Translation Yes/No |
|-------------|-----------|-----------------|------|---------|-------|-----------|--------------------|
| | B5 | | | | | | |
| | B6 | | | | | | |
| | B7 | | | | | | |

Other Art (Including Author, Title, Date Pertinent Pages, Etc.)

| Exam. Init. | Ref. Des. | Citation |
|-------------|-----------|---|
| | C6 | PCT/US02/06923 International Search Report (March 10, 2003) |
| | C7 | |
| | C8 | |
| | C9 | |
| | C10 | |

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INFORMATION DISCLOSURE STATEMENT — PTO-1449 (MODIFIED)

Page 1 of 2

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| (Use several sheets if necessary) | | | |
| U.S. Patent Documents See Page 1 | Foreign Patent Documents See Page 1 | Other Art See Page 2 | |

U.S. Patent Documents

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| | A1 | 6,187,951 B1 | 02/13/2001 | Baniel et al. | 562 | 580 | |
| | A2 | 6,087,532 | 07/11/2000 | Baniel et al. | 562 | 580 | |
| | A3 | 6,160,173 | 12/12/2000 | Eyal et al. | 562 | 589 | |
| | A4 | 4,100,189 | 07/11/1978 | Mercier | 260 | 541 | |
| | A5 | 5,780,678 | 07/14/1998 | Baniel et al. | 562 | 580 | |
| | A6 | 321,925 | 07/07/1885 | Waite | 203 | 95 | |
| | A7 | 5,510,526 | 04/23/1996 | Baniel et al. | 562 | 580 | |
| | A8 | 5,831,122 | 11/03/1998 | Eyal | 562 | 580 | |
| | A9 | 5,959,144 | 09/28/1999 | Baniel | 562 | 580 | |
| | A10 | 4,275,234 | 06/23/1981 | Baniel et al. | 562 | 584 | |
| | A11 | 5,138,074 | 08/11/1992 | Bellis et al. | 549 | 274 | |
| | A12 | 5,521,278 | 05/28/1996 | O'Brien et al. | 528 | 354 | |
| | A13 | 5,149,833 | 09/22/1992 | Hess et al. | 549 | 274 | |
| | A14 | 5,136,057 | 08/04/1992 | Bhatia | 549 | 274 | |
| | A15 | 5,142,023 | 08/25/1992 | Gruber et al. | 528 | 354 | |
| | A16 | 5,274,073 | 12/28/1993 | Gruber et al. | 528 | 354 | |

Foreign Patent Documents

| Exam. Init. | Ref. Des. | Document Number | Date | Country | Class | Sub Class | Translation Yes/No |
|-------------|-----------|-----------------|------------|---------|-------|-----------|--------------------|
| | B1 | WO00/64830 | 11/02/2000 | PCT | | | |
| | B2 | WO98/24777 | 06/11/1998 | PCT | | | |
| | B3 | WO98/55442 | 12/10/1998 | PCT | | | |
| | B4 | WO99/19290 | 04/22/1999 | PCT | | | |

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Page 2 of 2

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| U.S. Patent Documents See Page 1 | Foreign Patent Documents See Page 1 | Other Art See Page 2 | |

Other Art (Including Author, Title Date Pertinent Pages, Etc.)

| Exam. Int. | Ref. Des. | Citation |
|------------|-----------|--|
| | C1 | Perry, "Azeotropic Distillation"; <i>Chemical Engineers' Handbook, Fifth Edition</i> , 13:36-42, 1973. |
| | C2 | Holten, "Lactic acid; properties and chemistry of lactic acid and derivatives", pp. 20-21, p. 36-37, and p. 425, 1971. |
| | C3 | CRC Handbook of Chemistry and Physics, pps. D1-D33, 1981-1982. |
| | C4 | Co-pending Application Serial No. 09/809,649; Entitled: "Azeotropic Distillation Process for Producing Organic Acids or Organic Acid Amides"; filed: March 15, 2001 (Attorney Docket No. 2027.597000). |
| | C5 | Co-pending Application Serial No. 09/809,243; Entitled: "Process for Obtaining an Organic Acid from an Organic Acid Ammonium Salt, an Organic Acid Amide, or an Alkylamine-Organic Acid Complex"; filed: March 15, 2001 (Attorney Docket No. 2027.602000). |

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